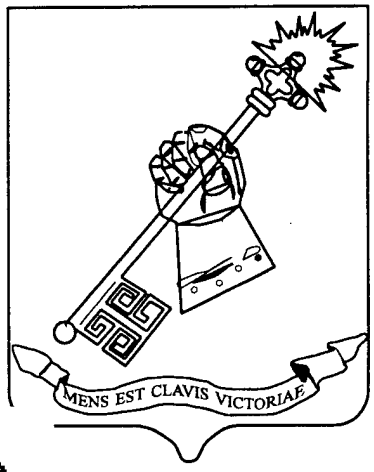
M1A2 TANK BATTALION ORGANIZATION: A CALL FOR INNOVATION

A Monograph
By
Major James F. Pasquarette
Armor



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ABSTRACT

M1A2 TANK BATTALION ORGANIZATION - A CALL FOR INNOVATION by Major James F. Pasquarette, USA, 51 pages.

This monograph analyzes proposed M1A2 tank battalion organizational alternatives presently under consideration by the United States Army Training and Doctrine Command. The U.S. Army has undergone numerous armor reorganizations since the invention of the tank in World War I. Throughout this eighty year period, tank battalion organization has remained relatively stable: 4 or 5 tanks per platoon; 3 or 4 platoons per company; and 3 or 4 companies per battalion. There was good reason behind such stability. Though the tank became more lethal and survivable over time, communications technology stagnated. Additionally, the Cold War prognosticators foresaw a need for large tank battalions closely aligned with their World War II heritage. Thus, the army relied upon historically proven small unit organizations to derive next generation organizations.

Reliance on historical precedence may not be possible for the Force XXI army for two reasons. First, informational technology will finally come on par with tank lethality and survivability. Armor commanders, through the Intervehicular Information System, will have immediate access to critical information requirements. This technology may render historical span of control theories archaic. Second, the strategic landscape has drastically changed. The army no longer focuses its attention on large scale conventional war in Central Europe. Rather, the army is now prepared to project forces anywhere in the world on short notice. The next conflict will most likely be fought on short notice against an unforeseen adversary. Adaptability, tailorability, and deployability have replaced lethalilty, survivability, and robustness as critical armor organization requirements.

The lack of historical precedence due to changes in both informational technology and the National Military Strategy requires force designers to interject innovative ideas into the Force XXI process. This is no easy task. The military, as an institution, is comfortable with the combat-proven status quo solution. However, the army must embrace innovative ideas to uncover the full potential of Force XXI. Cold War solutions to Force XXI issues will result in a 21st century army prepared to fight a 20th century war.

This monograph is divided into eight sections. Section one, the introduction, establishes the research question and the significance of the issue to the army. Section two is a historical summary of past U.S. Army armor reorganizational initiatives. Section three describes the characteristics that make M1A2 tank a significant improvement over its predecessor. Section four discusses two factors - span of control and the anticipated role of armor in the future - the call for the consideration of innovative ideas. Section five describes the U.S. Army Armor Center's methodology for deriving M1A2 tank battalion alternatives. Section six outlines the challenge of military innovation in peacetime. Section seven analyzes the Armor School alternatives in light of the factors discussed earlier. Section eight provides innovative recommendations concerning M1A2 tank battalion organization for consideration.

The monograph concludes that innovation is the key to a successful journey toward Force XXI. Reliance on past practices is a viable alternative under certain conditions. Such conditions may not exist given changes in technology and the future application of armor.

SCHOOL OF ADVANCED MILITARY STUDIES

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Introduction

"I understand that there is to be a new service of "Tanks" organized and request that my name be considered for a command in that service."

Letter from Captain Patton to General Pershing, 3 Oct 1917.[1]

At 3:00 PM on 23 March 1918, a train carrying ten Renault light tanks arrived at Bourg, France. By 8:40 PM that same day, the train had backed in to a special unloading platform designed by Major George S. Patton. The U.S. Army Tank Corps, conceived on paper five months earlier, was finally receiving its first allotment of tanks from the French. Patton, one of only two individuals in the American Expeditionary Force to have ever driven a tank, personally drove each tank off the train. After teaching nine other soldiers the mechanics of tank driving, Patton led the column of vehicles to a training area a mile away.[2] Such were the humble beginnings of armor in the United States Army.

Organizing tanks into effective fighting units has been a challenge for force designers for eighty years. Organizational decisions for Patton were simple in 1918: he did what he thought was right based on the minute armor experience to date. However, as the relevance of the tank increased, so did the complexity involved in determining the appropriate armor organization. Warfighting doctrine, unit standardization and technology have each played an influential role in shaping armor organization since World War II. Over the last forty years, force designers sought to leverage the tank's dominion as the primary system on the battlefield. This unchallenged assumption of armor's supremacy resulted in large, lethal battalions designed to excel on the plains of Central Europe.

Today, the army is again faced with an armor organizational review with the fielding of the M1A2 Abrams Tank. The potential inherent in this system - when applied in concert with complementary army acquisitions - stands to redefine land warfare. Several fire control upgrades

will increase the lethality of the individual tank. Other upgrades in armored protection will enhance its survivability. However, the potential revolutionary enhancement in this system is informational. The tank commander's real-time access to vital battlefield information may overhaul current command and control techniques. How extensive an impact this access to information will have on warfighting is presently unknown. However, the army will spend millions of dollars in the coming years to harness this technology and realize its potential.

Force designers consider myriad factors in determination of future organizational structures. Recent developments in both technology and the national security environment highlight the criticality of three specific factors: lethality, span of control and the anticipated role of armor in the future. First, the combination of fire control upgrades and informational enhancements will dramatically increase the lethality of the individual tank. This increased lethality may mean organizations could decrease in size without a corresponding decrease in capability. Yet, today's army seeks to maximize capability in lieu of designing structure against a particular threat. Second, the informational system enhancement in the M1A2 could result in a wider span of control at lower levels. However, an increased access to information may not translate directly to an increased span of control. Thus, the determination of the M1A2 battalion organization is not a pure science. In the end, force designers must make subjective assessments based on these and other span of control factors. Finally, scholars and strategists agree the world is a much different place than it was prior to the collapse of the Soviet Union. Gone is the well-defined global threat. In its place are nebulous regional ones. The National Military Strategy (NMS) has addressed this fact by reducing and realigning military forces. The U.S. military is no longer forward deployed. Rather, a preponderance of the force is based in the Continental United States poised for projection anywhere in the world on short notice. This fundamental shift in strategy has affected every aspect

of the United States' military planning. Recommendations on future armor organization must take this realignment into account.

The United States Army Training and Doctrine Command (TRADOC) is presently studying armor battalion organization alternatives. TRADOC will reshape the army ~~from the ground up~~ to meet the challenges of the twenty-first century. This future army (dubbed "Force XXI") will incorporate new systems and technology into a new doctrine. The United States Army Armor Center, along with other TRADOC schools, recommended tank battalion organizations for TRADOC review on 12 July 1995. TRADOC, in turn, will analyze these options through simulations, wargames and field training over the next several years. Once the analysis is complete, TRADOC will recommend to the Chief of Staff, Army a Force XXI organization for approval.

Force designers have relied upon historically proven solutions during past reorganizational initiatives. Decisionmakers are comfortable with the status quo, combat-proven answer. Additionally, the fact that armored warfare's dynamics have changed little since World War II has lent validity to reliance upon historically proven organizations. However, this phenomenon prevents innovative ideas from receiving proper recognition and consideration. The army must overcome this institutional stagnation or face becoming simply a smaller version of its Cold War self. The time is at hand to conduct a critical introspection of armor organization in the context of potentially revolutionary Force XXI technology. Simply applying historically proven solutions to Force XXI problems will not work. Innovation is the critical ingredient that will unleash the full potential of Force XXI.

Thus, the problem is clear: do the M1A2 tank battalion alternatives presently under scrutiny by TRADOC adequately consider innovative ideas? This monograph will attempt to answer this question by reviewing historical analyses of past reorganization initiatives, the M1A2 tank's

capability, factors bearing on the problem that mandate innovative ideas, and the challenges of military innovation in peacetime. This investigation will look beyond pure capability maximization that the parochial "schoolhouse" tends to focus upon. Rather, this monograph will take the approach that the tank is now merely a role player on the battlefield instead of the centerpiece. The result will be an analysis of the U.S. Armor Center methodology and recommendations on innovative M1A2 tank battalion organization considerations. Finally, the monograph will recommend areas for further research and consideration by TRADOC before settling on an armor battalion organization for the twenty-first century.

British historian Michael Howard noted in 1974:

> "...it is the task of military science in an age of peace to prevent the doctrine from being too badly wrong. All scientific thought is a sustained attempt to separate out the constants in any situation from the variables, to explain what is of continuing validity and to discard what is ephemeral, to establish certain abiding principles and to reduce them to their briefest, most elegant formulation."[3]

The Army faces such a challenge as it heads into the twenty-first century. Parochial or reactionary decisionmaking will undoubtedly result in a twenty-first century army capable only of fighting a twentieth century foe. A balanced view that considers all factors affecting the problem is the only way to make sure the army doesn't get it "too wrong."

Historical Background of U.S. Army Armor Organization

> *"So long as ideas per se are all that are at issue relatively little objection is encountered in the reform process. Changes in organizations..., however, carry with them specific and frequently adverse consequences for various groups of the military organization. The desire of the threatened groups not to lose influence and a genuine conviction that these groups make a significant contribution to victory in combat act to impede change."*[4]
>
> Harold R. Winton

Harold Winton's quote has been particularly applicable in reference to past U.S. Army armor reorganization initiatives. Yet, this is not to imply that the armor community has cornered the market on impeding change. The army, as an institution, has historically resisted change. The fact

that the army has been fairly successful in its twentieth century endeavors has contributed to this phenomenon. Nevertheless, there have been several armor reorganizations since 1917 for a variety of reasons. Doctrine, technology and standardization have each driven armor organization review. A summary of U.S. Army armor organizations brings to light the methodologies adopted in the past to resolve reorganization initiatives.

World War I: Army Infancy

World War I was the impetus behind the development of the first armor organizations. The army entrusted the effort to George S. Patton. Patton, seeking to distinguish himself from the hundreds of other infantry and cavalry officers in France in 1917, requested the assignment as the first Tank Corps Commandant in personal letters to General John J. Pershing.[5] Pershing approved Patton's request in November, 1917.[6] Patton's charge was to organize a school for American soldiers on use of the tank. Once established, the school would be the instrument to organize tanks into units.[7]

Patton traveled extensively in late 1917 to gather information on the tank. He and Lieutenant Elgin Braine traveled to Chamlieu, France in mid November, 1917 to study French tanks and their related tactics. After two weeks in Chamlieu, he visited British officers to discuss their employment of tanks in the recently concluded Battle of Cambrai. Finally, he traveled to the Bilancourt tank factory outside Paris to study tank mechanisms.[8] Upon return from Paris, Patton wrote a paper recommending a tank battalion organization as follows: five tanks per platoon; three platoons and headquarters section per company; and three tank companies per battalion.[9] The fact that the tank was a weapon with the potential to break the Great War's bloody stalemate and that Patton was the sole U.S. Army expert served to have his organizational recommendations approved immediately. General Pershing approved the organization of five heavy tank battalions and twenty

light tank battalions in the American Expeditionary Force in accordance with Patton's recommendations.[10]

Between the Wars: Infantry/Cavalry Rivalry

World War I left the tank's utility an unresolved issue. Two schools of thought emerged in the 1920s. One school endorsed the tank's continued subservience to infantry while the other advocated an independent branch of service. The Infantry School had recent history on their side of the argument - World War I was an infantry and artillery war. The Cavalry School embraced the visionary notions of J.F.C. Fuller and Liddell Hart. To them, World War I provided a glimpse of future warfare comprised of large, independent armored formations. These two schools of thought clashed for two decades with little resolution. The responsibility for designing tank organizations bounced back and forth between the Infantry and Cavalry schools in the 1920s and 1930s. As a result, neither school accomplished much toward tank organization between the wars.[11]

Branch rivalry was not the only factor that impeded the mechanization of the army. Post-World War I demobilization, the Great Depression and an isolationist foreign policy also contributed to a woefully unprepared U.S. Army at the time of Germany's unveiling of blitzkrieg tactics in 1939-40. The army, shocked to its senses literally overnight, created the "Armored Force" on 10 July, 1940. The creation of the 1st and 2nd Armored Divisions followed within days.[12] Additionally, the army organized GHQ Reserve Battalions to provide armor support to infantry divisions to appease the Infantry School.[13] Overnight, the United States Army had a division organization built around the tank without an agreed upon organization at brigade and below.

The army relied upon two sources to derive armor organization between the establishment of the armored divisions and the United States' entry into World War II. First, the army studied

German armor organization and adopted their structure as appropriate.[14] The German Army's success in Poland and France was incontrovertible. It would have been irresponsible to ignore their recently proven doctrine and organization. Second, the army held the Louisiana Maneuvers. These exercises in 1940-41 exposed flaws and identified strengths in recently organized armor units.[15] Once technology caught up to doctrinal and organizational development, U.S. Army armor units performed admirably on World War II battlefields.

World War II: Trial by Fire

The United States Army can attribute a portion of its World War II success to introspection. The army sent senior armor force officers to the front lines in North Africa early in the war to evaluate tank unit performance and recommend modifications.[16] Evidence garnered by these officers revealed armored divisions were relying too heavily on the tank. Between January and August 1943, the army held several conferences on armor organization based on the findings in North Africa. Several organizational decisions emanated from these conferences. First, the army reorganized the armored division in 1943 in search of a better balance between infantry and armor. The number of tanks per division decreased from 390 to 263 while the amount of armored infantry increased from 1602 to 2259.[17] Fourteen of the sixteen armored divisions that participated in World War II fought under this modified organization.[18] Additionally, the reduction in tanks per divisions enabled each infantry division to have its own permanently attached tank battalion. Though still not an authorized part of the infantry division, this move alleviated the need for a GHQ tank battalion pool. Finally, the tank battalion became standardized. Prior to August 1943, there were separate light and medium tank battalion organizations and a unique heavy tank battalion organization under development. The army reorganized each tank battalion to be alike and interchangeable: each battalion had three companies of medium tanks, a company of light

tanks, and six medium tanks mounting 105mm howitzers.[19] This is the tank battalion organization that landed at Normandy and fought across France into Germany.

Post World War II: Reliance Upon Experience

The army once again faced a huge demobilization after World War II. The strategic environment in the mid-1940s was similar to the late 1980s: the world remained a dangerous place, but the threat was not clearly identifiable. This fact - combined with the inevitable armor/infantry rivalry during a period of drastically reduced resources - resulted in several unique tank organizations designed to provide flexibility during this period of uncertainty. The opinions of several hundred armored force combat leaders served to shape the Cold War army. By the late 1940s, the army had four different battalion level and below tank organizations.[20]

	Co's	Plt's	Tanks/plt	Total tanks
Tank Bn (90mm), Inf Div	3	4	5	71*
Tank Bn (90mm), Ar Div	4	3	5	70*
Tank Bn (120mm), Ar Div	3	4	5	71*
Tank Co, Infantry Regt	1	4	5	22*

* Includes HQs element tanks

A series of General Boards assembled the expertise from the combat veterans. These boards queried armor and infantry leaders on various aspects of armored warfare. In general, the veterans agreed that the five-tank platoon was the optimum size based primarily on combat experience. Five tanks provided the firepower needed on the battlefield while remaining within the platoon leader's span of control. There was some discrepancy on the number of platoons per company. Some advocated three platoons based on the organization of World War II battalions. However, others preferred four platoons in order to provide the commander with a personal reserve after the attachment of platoons to infantry companies. There was a similar discrepancy on the number of

companies per battalion. Again, some preferred four based on World War II experience while others endorsed three companies as more complementary to the army. The end result was the various above-mentioned tank battalion organizations throughout the army.[21]

The army reorganized once again in the 1960s. The Pentomic Division - created under the apprehensions of an all-out nuclear war in the 1950s - gave way to the more conventional ROAD (Reorganization Objective, Army Division) organization. The primary benefit of the transition was standardization. The ROAD concept standardized divisions across the army. This reduced unnecessary overhead and confusion inside and outside the army. Maneuver units - including tank battalions - were a part of this reorganization.[22] The army created the 54-tank variant (5-tank platoon; 3 platoon company; and 3-company battalion) as the standard battalion across the army. This organization sufficed for twenty years.

Division 86: A Change in Organization to Accommodate Technology

The United States Army lacked confidence in its capability in the mid-1970s. Vietnam, of course, was a significant contributor to this state of mind. The country viewed the war in Southeast Asia as a military loss. However, the fact that most soldiers believed the army would lose a non-nuclear war with the Soviet Union in Central Europe was an even greater problem.[23] General William DePuy, the first commander of TRADOC, set out to change the army's attitude by overhauling its warfighting doctrine.

General DePuy believed the 1973 Yom Kippur War was a microcosm of a potential war with the Soviet Union. This eighteen day war provided several lessons that eventually shaped the army's doctrine. First, though tanks remained the most powerful force on the battlefield, they could not operate independently. Second, ammunition expenditure and vehicular loss rates were startlingly high. Third, though wire-guided missiles were an important new weapon, tanks continued to be the primary destroyer of other tanks. Finally - and most importantly - an

outnumbered force that maintained the offensive spirit can win.[24] General DePuy set out to rewrite current army doctrine from these lessons.

TRADOC published three variations of FM 100-5 between 1976 and 1986. The first revision in 1976 embraced the concept of "active defense." It drew criticism for being too defensive-minded. The subsequent 1982 version sparked controversy among NATO allies for its offensive stance. It advocated deep attacks across the Inter-German border by ground maneuver units to destroy Soviet second and third echelon forces. Finally, the 1986 version, dubbed "Airland Battle," addressed NATO political concerns while remaining fundamentally offensive-oriented.[25]

The planned fielding of the M-1 Abrams Tank, M-2 Bradley Infantry Fighting Vehicle, Multiple Launch Rocket System (MLRS), AH-64 Apache attack helicopter and other systems complemented TRADOC's doctrinal shift. These systems accorded army commanders the capability to interdict numerous Soviet echelons simultaneously - the essence of Airland Battle. TRADOC understood that current organizational structure may be incompatible with the latest weapon systems and offensive doctrine. Thus, General DePuy mandated the Division Restructuring Study (DRS) on 4 March 1976. The DRS objective was straightforward: "prepare the U.S. Army to integrate into the force the new weapon systems of the early 1980's and to optimize their employment."[26] It consisted of four phases: a developmental phase that addressed doctrinal manuals, tactics and garrison operations; a battalion phase that consisted of selected instrumented field exercises to identify critical issues pertaining to maneuver units; a brigade phase that examined the capabilities and organization of maneuver units; and an analysis phase that evaluated aspects of the DRS that could not adequately address with in the constraints of the test program.[27]

Subordinate to the DRS were several supportive studies. One such study focused on answering the following question: "given a certain number of tanks in the force, what is the best

organization structure for combat?"[28] Testing in the first two phases supported the adoption of a three tank platoon, eleven tank company, three company / thirty-six tank battalion.[29] The rationale behind the reduction in platoon size (from three to five) stemmed from the platoon leader's span of control capability. Orchestrating fire and maneuver of heavy and light sections at platoon level tended to overwhelm platoon leaders. Thus, initial analysis supported a three tank / single section platoon to streamline span of control.[30] However, the subsequent brigade phase of the test recommended a four tank platoon based on expected operational rates.[31] In other words, a platoon required four tanks to ensure three were ready for combat. Additionally, the brigade study recommended:

a. a three platoon company. Field testing found three platoons the maximum a company commander could effectively command and control.

b. a three company battalion. The study recommended an anti-tank (optically wire-guided missile) company organic to the tank battalion. This company would provide a base of fire enabling the battalion commander the freedom to maneuver three tank companies.[32]

The army accepted the four tank platoon, three platoon company recommendations. However, it rejected the three company battalion recommendation in favor of a four company variant that could facilitate cross-attachment with a similarly-organized mechanized infantry battalion.[33] This organization, comprised of 58 tanks, became an integral part of the army's new division derived from the DRS: Division 86. It remains today as the army's tank battalion organization in 1995.

In summary, over the last eighty years there have been numerous tank unit organization reviews for myriad reasons: doctrinal renovation, technological enhancements and standardization initiatives. In general, the army conducted organization reviews with an eye toward future requirements. However, the U.S. Army has lacked innovative ideas in tank battalion

organizational design since World War I. Why? In short, organizational debate prior to World War II was non-existent due to branch rivalry. Since World War II, there have been marginal adaptations in armored warfare doctrine and tank technology. As a result, organizational review initiatives required little innovative thought. Logically, force designers perceived historically proven organizations as the potential solution for future designs.

The military relies upon history to provide answers more than other institutions. This is especially true in peacetime. History may furnish military decisionmakers with potential solutions to complex problems. This is possible when the general character of the problem remains constant. However, a fundamental shift in the character of the problem can mitigate history's ability to provide potential solutions. Force XXI operations may be a fundamental shift in the conduct of land warfare. If so, innovative ideas, rather than history, will provide the answer to the present force design issue.

The M1A2 Tank

> *"We must study the great captains of the past to learn of their principles, and, above all, of their character, but do not let us be tied too much to their methods. For methods change with every change of armament and equipment."*[34]
>
> Adna R. Chaffee, Jr.

The ability to shoot, move and communicate are the armor officer's staple requirements. The 100-hour ground offensive in the Gulf War left little doubt that the U.S. Army's M1A1 tank currently fulfills the first two requirements better than any of its peers. However, communication technology has changed little since the Korean War. The M1A1 tank remains outfitted with limited-range voice radios to exercise command and control. Communications technology will make a radical leap forward with the fielding of the M1A2 tank.

The M1A2 Abrams Main Battle Tank may look little different to the casual observer than the M1A1 tank. Both are powered by a 1500 horsepower diesel turbine engine capable of generating

tremendous speed and power. Additionally, the armament that outfits both tanks remains the same: a 120mm smoothbore main gun, a 50 caliber machine-gun, and a 7.62 mm coaxially mounted machine-gun. Thus, the capability of both tanks to shoot and move appear identical. However, the casual observer would be well-served by a centuries-old caution: don't judge a book by its cover.

The M1A2 tank - when employed in concert with other complementary systems - stands to revolutionize land warfare. It is true that the M1A2 will both shoot similar caliber weapons and move no faster than the present M1A1. However, technological upgrades in fire control and communications will concentrate the effects of the tank's speed and weapons. The end result will be a system substantially more lethal than its predecessor.

The most significant fire control enhancement on the M1A2 is the Commander's Independent Thermal Viewer (CITV). The CITV is a separate and independent thermal imaging system designed for the use by the tank commander. It is independently stabilized from both turret and hull movements. Thus, the tank commander can scan for and acquire targets under limited visibility conditions in a sector separate from the gunner. Additionally, the tank commander can lay the main gun on an acquired target automatically with the flip of a switch. The net result is a minimal time to acquire and engage multiple targets. Later versions of the M1A2 will include second generation forward looking infrared radar (FLIR) technology to further enhance the tank's ability to acquire targets. This enhancement, along with the Improved Commander's Weapon Station and other fire control upgrades, will undoubtedly increase the lethality of the individual tank.[35]

Fire control enhancements, though important, are not the principal characteristic that separated the M1A2 from the M1A1. Rather, the Intervehicular Information System (IVIS) is the M1A2 feature that stands to change land warfare as it is known today. IVIS is a part of the

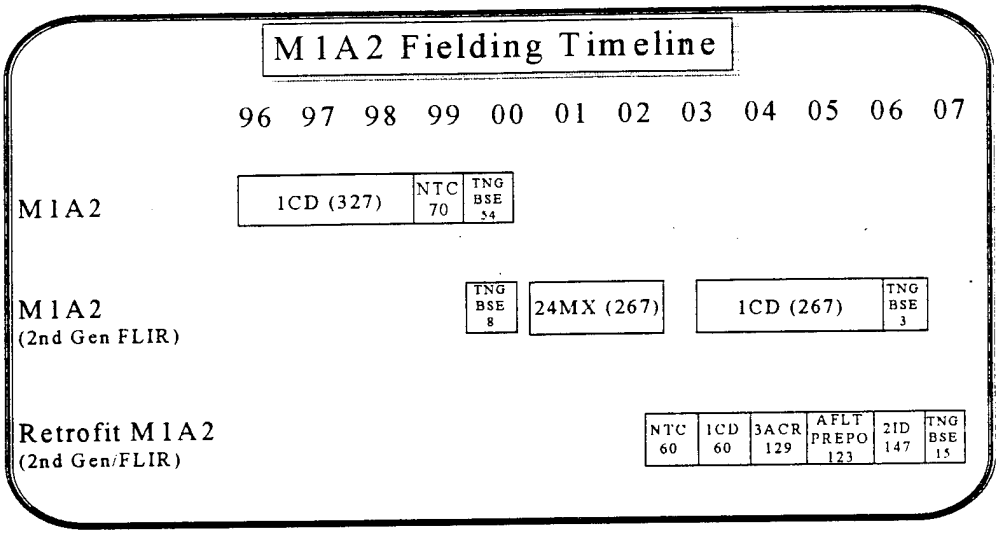
Battalion and Below Command and Control (B2C2) system. B2C2 will integrate informational awareness between various weapons systems operating at the battalion level.[36]

IVIS will provide the U.S. armor commander with a definitive advantage over his opponent on the battlefield. The system will provide instantaneous common situational to armor leaders through digital transmission of vital information: location of friendly vehicles; location of identified enemy vehicles; maintenance condition; ammunition status; fuel levels; and other relevant information. Additionally, the system permits the digital transmission of orders, graphics and calls for indirect fire. The advantages are obvious. IVIS will provide the commander and his subordinates a real-time, accurate bird's-eye view of the battlefield.[37]

The potential capability elemental to IVIS, B2C2 and other related informational systems is the crux of Force XXI technology. For the first time, commanders at various levels will possess the vital information required to make tactical decisions literally at the touch of a button. How this capability will affect future land warfare is presently unclear. However, there is the potential that this informational technology, if understood and harnessed, will redefine the conduct of land warfare. As reiterated above, historical analogies would then have limited utility in deriving Force XXI solutions. Again, innovation becomes the mechanism by which informational technology will realize its advertised potential.

The United States Army will field the M1A2 tank between 1995 and 2007. The extended fielding timeline is due to a scheduled retrofit of initial issue M1A2 tanks beginning in 2000. (See chart below) Fiscal constraints have limited the army's planned M1A2 procurement to high priority requirements: contingency corps units (1st Cavalry Division, 24th Infantry Division, and 3rd Armored Cavalry Regiment); the 2nd Infantry Division; the National Training Center; and the afloat prepositioned set of equipment. While TRADOC wrestles with Force XXI, the army will field M1A2 tanks under the present M1A1 organization: 4-tank platoons; 3-platoon companies; 4-

company battalions; and 58 total tanks.[38] The army will reorganize battalions accordingly once TRADOC settles on a Force XXI organization for the M1A2.



Technology is the leverage the United States military plans to exploit against its future foes. The technology inherent to the M1A2 is an integral part of this strategy. It is arguably the most sophisticated and potentially lethal weapon system on the battlefield. The challenge ahead for the army is to harness the potential through trial and error testing over the next several years. Failure to realize the advertised potential will render the M1A2 just another Cold War-vintage tank.

Factors Bearing on the Problem

> *"...the average human brain finds its effective scope in handling from three to six other brains."*[39]
>
> British General Sir Ian Hamilton

Force designers consider myriad factors during organizational analysis. Doctrine, training, materiel, lethality, manning and expected operational readiness rates are examples of factors that impact on development of organizational alternatives. However, there are three factors that should have distinct impact on M1A2 tank battalion organizational alternatives: lethality, span of control and the anticipated role of armor in the future. The combination of technological advancements and the new security environment may challenge the viability of historically proven organizations.

M1A2 organizational alternatives must consider the potential impact the future holds in these two critical areas.

Lethality

Lethality has long been a significant factor impacting on armor organization. In simple terms, the lethality of a given tank relates to its survivability on the battlefield and its capability to acquire and engage targets. One tank is relatively more lethal than another if it can acquire and engage targets more efficiently and is more survivable. Few will argue that the M1A2 will be the most lethal tank on the battlefield.

The influence of the M1A2's increased lethality on organizational decisions is ambiguous. Logically, small M1A2 tank units will be able to operate on the battlefield with the same efficiency as large M1A1 tank units. Hence, perhaps 30 M1A2 tanks will be as effective in the future as 58 M1A1 tanks are today. However, the U.S. military is no longer a threat-based institution. During the Cold War, U.S. strategists structured the military to counter the Warsaw Pact. More specifically, the army - through calculations based on Soviet capability - determined the required lethality per type unit necessary to warrant victory. Force designers then structured platoons, companies and battalions from the base calculations.[40] The net result was a tank battalion organized to defeat several of its counterparts on the World War III battlefield.

Today, the U.S. military is capabilities based. This has lethality-related implications. First, the lack of a significant threat to base U.S. force structure upon calls into question the need for exceptional lethality. Additionally, a capabilities based force does not provide army strategists with neat calculations to determine required lethality. Conversely, the NMS embraces the application of overwhelming decisive force to achieve victory quickly with minimal U.S. casualties.[41] Only highly lethal forces can achieve such superiority.

The conflicting signals described above serve to muddle lethality's pertinence as a factor in determining M1A2 organization. Analytically, the increased lethality inherent in the M1A2 relative the M1A1 would lead one to believe smaller battalion organizations are in order. Yet, there is evidence supporting the theory that more lethal tanks do not translate neatly into smaller armor organizations.[42] Thus, the ambiguity evident in lethality relative the M1A2 does not deny proponents of larger M1A2 battalions from extolling their views. In the end, force designers must consider lethality. However, M1A2 lethality considerations must incorporate more than the ability of the individual tank to acquire and engage targets. It must also consider the system's lethality in relationship with the advanced informational technology. Again, past experience is of little value in this respect. Innovative alternatives that consider lethality in this larger context will best serve the army in the long run.

Span of Control

Span of control revolves around the individual's ability to manage subordinates. It is hardly a sole concern of the military. In fact, there have been countless studies by several disciplines analyzing the optimum leader-to-led ratio. Mathematicians, psychologists, sociologists, organizational management, military theorists, and army doctrinaires have each studied this complex issue. Though each attacks the problem from a different angle, their base concern is consistent: the amount of information the human mind can effectively assimilate. Their findings are relatively complementary. However, the advent of informational technology such as IVIS may fundamentally challenge current span of control theory. Force XXI organizational decisions must take into account this future - yet untested - technology in the face of contrary historical evidence. A short recapitulation of the various disciplines' span of control theory frames the issue.

The span of control problem is as old as the earliest stories in the bible. Moses' father in law, seeing that Moses was spending an inordinate amount of time supervising too many individuals,

recommended he designate "officers over groups of thousands, of hundreds, of fifties, and of tens ... Thus, your burden will be lightened, since they will bear it with you."[43]

Carl von Clausewitz addressed span of control from the general's perspective. He acknowledged the simplicity of a general having just three or four subordinates. However, he notes that "a general has to pay dearly for that convenience in two ways."[44] First, orders "progressively lose speed, vigor, and precision" in organizations that have many levels of command.[45] Second, Clausewitz recognized the lost influence a general has over this men in such situations. "A general can make his authority over 100,000 men felt more strongly if he commands by means of eight divisions than by means of three divisions."[46] Clausewitz then warns the reader on the limitations of larger spans of control:

> "On the other hand, the total number of parts must not become so large that confusion will result. It is hard enough to manage eight subdivisions from one headquarters; ten is probably the limit. In case of a division, however, in which there are far fewer means for transmitting orders into action, four, or at the most five subunits, must be considered the appropriate figure."[47]

Though Clausewitz' musings focused on higher echelons, his rationale remains applicable at lower levels. There is a balance between small and large span of control. The commander must realize the strengths and weaknesses of both organizations and select the appropriate span of control for a given situation.

V.A. Graicunas, a French management consultant, based his span of control theory on the number of possible relationships given a various number of subordinates. He took into consideration the complexity intrinsic to organizations by acknowledging the differing relationships in dealing with subordinate individuals and groups. The amount of complexity (relationships) increased exponentially beyond five subordinates. Thus, simple mathematics favors organizations with less than six subordinates per manager.[48]

Psychology holds that an individual can manage seven familiar ideas concurrently. However, several variables (stress, familiarity, training and capacity) serve to further limit span of control.[49] To the psychologist, the stress and unfamiliarity of combat would limit the number of subordinates a leader could effectively manage to some number less than seven.

Primary group theory concludes that groups of four to five have the greatest cohesion and make the best decisions. Smaller groups are more cohesive, yet make poor decisions due to lack of reason. Larger groups make better decisions, yet lack cohesion. Cohesion is imperative in military units. However, the relevance of group decision-making in the military - especially in a combat situation - is questionable. Still, sociology advocates an organization with three to four subordinates per leader to maximize cohesion and group decision-making.[50]

The business world's concern with organizational effectiveness has focused its attention on span of control theory. Management theory supports situational span of control considerations. Narrow spans of control are faster and more effective at problem solving while wider spans of control result in faster information flow and individual satisfaction. Each business must assess the particular factors that influence their own span of control capacity and structures its organization accordingly.[51]

Finally, current army doctrine does not specify span of control parameters. Rather, it provides general guidelines for organizations. The army acknowledges the debilitating effect combat has on a leader's ability to manage subordinates. The U.S. Army averages five subordinate units per headquarters. However, the combat arms unit average is just three subordinates per headquarters. Support units, somewhat shielded from the stress of battle, can afford a wider span of control than its brethren on the front line.[52]

In summary, span of control theory - regardless of the discipline - avoids specifying prescriptions for organization. Instead, each discipline bestows considerable weight to the

particulars that may influence the specific organization. In general, span of control theory across the disciplines endorses Koontz, O'Donnell and Weihrich's summation in Management:

> "... there is a limit in each managerial position to the number of persons an individual can effectively manage, but the exact number in each case will vary in accordance with the effect of underlying variables and their impact on the time requirements of effective managing."[53]

While current span of control theory is well-documented, the army has done scant work on span of control in the information age. If the various information systems perform as advertised, leaders will have the capacity to directly control more subordinates. However, the army is wary that such control may stifle initiative at lower levels. Some believe this technology will be to Force XXI what the helicopter was to the Vietnam army: a tool for senior commanders to directly control tactical operations several echelons below their level of command. Force XXI span of control will remain a mystery until the army acquires and tests these systems to gain an appreciation of their potential. However, the possibility exists that present span of control theory may become archaic with this revolutionary technology. The army must consider innovative spans of control at the lowest levels during organizational development to unharness the potential of Force XXI technology.

Armor and Future Warfare

Everyone agrees the world today is different than it was ten years ago. What few can agree upon is the future. Armor will continue to have utility on the battlefields of the next century. However, its role will be quite different than the previous fifty years. One must answer three questions to gain an appreciation of armor's future role. How has the National Military Strategy changed since the end of the Cold War? What is the nature of future warfare? Finally, what is armor's role given the new strategy and anticipated nature of future warfare?

First, how has the NMS changed since the end of the Cold War? U.S. strategic planning was a simple affair until the late 1980s. The U.S. faced a clearly defined global threat that possessed a

comparable capability. War plans focused on a conventional and hopefully-limited nuclear clash in Europe between NATO and Warsaw Pact forces. At the same time, the United States continued to embrace President Truman's strategy of containment. Force requirements derived from this strategy trickled down to the services. In turn, they developed force structure to support a potential "World War III" in Europe while remaining flexible enough to "contain" communism around the world.[54] For the armor community, the focus was squarely on Europe. As discussed earlier, armor unit organization relied primarily upon the World War II experience in determining the appropriate organization. While this process probably seemed extremely complex and disjointed at the time, it cannot compare to the complexity and uncertainty that exists today.

It is an understatement to say the Soviet Union's implosion has complicated U.S. strategic planning. There was little time to celebrate the Cold War victory. The stability of a bipolar world was replaced by a an explosion of regional tensions long suppressed by Soviet domination. Though the chance of global war became highly improbable, national security officials soon recognized the world was a much more unstable - hence dangerous - place.[55]

The new NMS recognized unpredictable regional instability as the most likely threat to U.S. national security. To deal with this unpredictability, the strategy shuffled military forces around the world. Forward presence (a force deployed in a theater to support U.S. political interests) replaced Cold War forward stationing (a force deployed in theater designed to counter a specific threat). In turn, a preponderance of military forces redeployed to the Continental United States (CONUS). This realignment of forces - complemented by an extensive investment in strategic mobility - gave the United States military the flexibility required to respond anywhere in the world on short notice.[56]

The implications on the new NMS for armor are twofold. First, the best trained, manned and outfitted armor units are now in the United States. For years, just the opposite was true. West

Germany was home of the army's most combat-ready heavy units during the Cold War. As earlier stated, only Contingency Force units based in CONUS will eventually receive the M1A2 tank. Additionally, Contingency Force units receive preference in training dollars and manning levels. Second, armor units must be rapidly deployable. This, to some, is an oxymoron. However, this is a Cold War mind-set. The Department of Defense will spend over seven billion dollars building fast sealift specifically designed to move heavy army units.[57] In addition, the Army Strategic Mobility Program will spend over three billion dollars over the next six years to improve army deployability from CONUS "fort-to-port."[58] Railcar purchases, railhead enhancements, airfield expansion, and port facility upgrades are examples. Finally, heavy units are now conducting Sea Emergency Readiness Exercises (SEDREs) to train heavy units specifically on deployment requirements.[59] The objective of these programs is to facilitate the rapid projections of heavy army forces to a crisis area anywhere in the world.

What will be the nature of future warfare that the CONUS-based, rapidly deployable heavy force will face? The U.S. Army and academic scholars have struggled to answer this question. The root cause of future war remains in dispute among the various experts. However, there is general agreement on the nature of future warfare. Weapons technology will enhance range, accuracy and lethality of myriad systems - making the future battlefield an incredibly dangerous place. Additionally, informational technology will enhance the application of these highly lethal weapon systems. While the United States may lead the way in fielding such systems, the proliferation of weapons and technology will eventually "level the playing field." What, specifically, do the experts have to say about future warfare?

The U.S. Army has articulated its vision of future warfare in *TRADOC Pamphlet 525-5: Force XXI Operations*. As described in the forward, this publication "describes the conceptual

foundations for War and Operations Other Than War in the early decades of the twenty-first century."[60] It outlines the dominant aspects of the future conventional battlefield as:

- battle command: command remains a combination of art and science. However, informational technology will serve to further disperse the battlefield. New leadership and command approaches by commanders will be necessary. First-line leaders will face unprecedented demands on their decisionmaking abilities.

- extended battle space: the depth, breadth and height of the battlefield will continue to grow.

- spectrum supremacy: informational technologies will ensure future operations will unfold before a global audience.

- rules of war: warfare is becoming less civilized. Actions once regarded as criminal are now deemed acceptable if performed by a nation.[61]

TRADOC PAM 25-5 also discusses future threats. Though the U.S. military may deter most adversaries from open aggression, war with regional powers possessing armor-mech based armies remains a possibility. However, low-intensity conflict or Operations Other Than War (OOTW) will be the most likely conflicts involving U.S. forces.[62]

Finally, and most significantly, *TRADOC PAM 525-5* provides the army with guidance on force design to meet the challenges of the twenty-first century:

> "our Army must design organizations and develop capabilities that will allow it to be rapidly tailorable, rapidly expansible, strategically deployable, and effectively employable as part of a joint and multinational team to achieve decisive results in future War and OOTW in all operational environments."[63]

In addition, the pamphlet suggests emerging technology may simplify management and control of crucial information. This will result in "flatter" organizations. Staffs will be smaller, yet capable of performing more functions.[64]

The army is not alone in its pursuit to understand the future. Civilian scholars are equally interested in the nature of future warfare. Chris Bellamy, a British historian, published The Future of Land Warfare in 1987. Bellamy proposed a war between the United States and the Soviet Union would have an uncanny resemblance to the protracted warfare of World War I. Though this

contradicts conventional wisdom today, he provides a provocative assessment of air-land battle's utility on the future battlefield. Bellamy asserts that the battlefield will become more dispersed with the fielding of new technologies. Air-Land Battle, requiring hundreds of square kilometers to operate as conceived, may have "spaced itself out of existence."[65] His assertions would certainly apply to Force XXI operations as the battlefield becomes even more dispersed.

Bevin Alexander, an American Historian, published The Future of Warfare in 1995. He believes the United States will maintain its technological edge well into the next century. However, he admonishes the military to avoid complacency. Operation Desert Storm was an aberration. Potential foes "took notes" and will not make the same mistakes as Saddam Hussein. Additionally, there are low-tech counter-measures to every high-tech system. Finally, Alexander insinuates operationally flexible air assault divisions should replace cumbersome armored divisions due primarily to the waning utility of the tank.[66]

There are several implications for armor given the proposed nature of future warfare. First, "tailorability" is the key to power projection operations. The army will not receive approval to project every asset into theater deemed necessary to accomplish the mission. Force ceilings established by civilian authority will drive planners to consider ad hoc organizations for specific missions. Thus, armor unit organization must consider tailorability. In short, force designers must ensure battalions and companies can operate independent of their organic parent unit.

Second, the army will employ armor both jointly and in support of light operations. These two milieus - once deemed the exception - may now become the rule. The attachment of the 2nd Armored Division's "Tiger Brigade" to a Marine Corps division during Operation Desert Storm (ODS) is a pretense of future operations. In response to a Marine Corps request for more M1A1 tanks, Congress directed the Department of Defense to report on the feasibility of standardizing armor support for the USMC along the lines of ODS.[67] Also, the army will employ armor in

support of light forces in lesser regional contingencies or in OOTW. Again, tailorability is critical. It is conceivable that a platoon may be the armor force of choice to support light forces in certain contingencies. Force designers must consider this compatibility of informational systems at various echelons with USMC and army light forces.

Third, deployability will compel force designers to contemplate smaller units. Today, armor units are marginally deployable. Strategic mobility programs have helped matters, but the armor community must consider smaller organizations to further leverage sealift and airlift assets. The present fifty-eight tank organization requires too much precious roll-on, roll-off cargo space.

Finally, utility of armor over time will wane. For decades, the army prepared for large scale conventional conflict in Central Europe. Both the threat capability and the theater environment supported substantial investments in armor. Today, the threat has vanished. Additionally, there is a limited employability of armor in theaters outside of Europe and Southwest Asia. The likelihood of large-scale maneuver warfare by heavy forces remains but a remote possibility. Simply stated, armor's day in the sun has past. The future employment of armor will be in a small scale supportive role. Again, the tailorability of armor organizations becomes critical.

In summary, lethality, span of control and the anticipated role of armor in the future accentuate the congenital limitations of historically based organizational alternatives. There was solid rationale supporting the rough parity in armor organizations for eighty years. However, fundamental changes in both technology and the strategic environment challenge the viability of reliance upon the past.

M1A2 Tank Battalion Alternatives

> *"Force XXI is the reconceptualization and redesign of the force at all echelons, from the foxhole to the industrial base, to meet the needs of a volatile and ever changing world."*[68]
>
> Secretary of the Army Togo D. West and General Gordon R. Sullivan

The army may not discern tangible results from General Sullivan's tenure as Chief of Staff until the next century. Though some may construe this as criticism, in actuality it is a tribute to his vision. Authentic institutional change does not transpire overnight. Thus, he initiated a process by which the army could focus its intellectual energy on reshaping itself contingent upon the capabilities and requirements of the next century. Force XXI became this process. TRADOC has nurtured this effort since its conception. George T. Singley III, the Deputy Assistant Secretary of the Army for Research and Technology, best describes the objective of Force XXI:

> "Force XXI seeks to experiment with, demonstrate, analyze, develop and field the requisite modern technology, doctrine, tactics, techniques and procedures for a well-equipped, well-trained and well-led Army of the 21st Century, organized to master information age technology and defeat any threat, anywhere, swiftly, with few casualties."[69]

One of the major objectives of Force XXI is division reorganization. TRADOC is presently staffing three division alternatives:[70]

- Alternative 1: Present division organization. Separate heavy and light divisions with their associated combat support and combat service support.
- Alternative 2: Heavy/Light Small Base Division: Each division would contain an armor heavy brigade, a mech heavy brigade and an air assault brigade.
- Alternative 3: Brigade Based Division Concept: The army would reorganize with the brigade as the base unit. Division headquarters would consist solely of combat support and combat service support units normally associated with that echelon. The army would tailor divisions with brigades dependent upon the contingency.

The army plans to reshape the division from the bottom up. Thus, decisions on platoon, company, battalion and brigade organizations will precede a decision on a division organization. The U.S. Army Armor Center at Fort Knox, Kentucky has responsibility for the armor battalion and below organizational review. Once TRADOC receives approval from the Chief of Staff, Army on a proposed brigade organization, 2nd Armored Division (the army's designated testbed) will field test and validate the organization. Final approval of the brigade organization will occur in 1997.[71]

The Armor Center briefed the Combined Arms Center (CAC), Fort Leavenworth on proposed M1A2 armor battalion alternatives for Force XXI on 12 July 1995. Their defined tasking from TRADOC was as follows: *Develop battalion and lower organizational designs to URS (unit reference sheet) level of detail for alternative division concepts.*[72] Next, the Armor Center described the essence of the Force XXI tank battalion:

- Destroys enemy forces in the close battle.
- Survivable, lethal and versatile.
- Can task organize with mechanized infantry.[73]

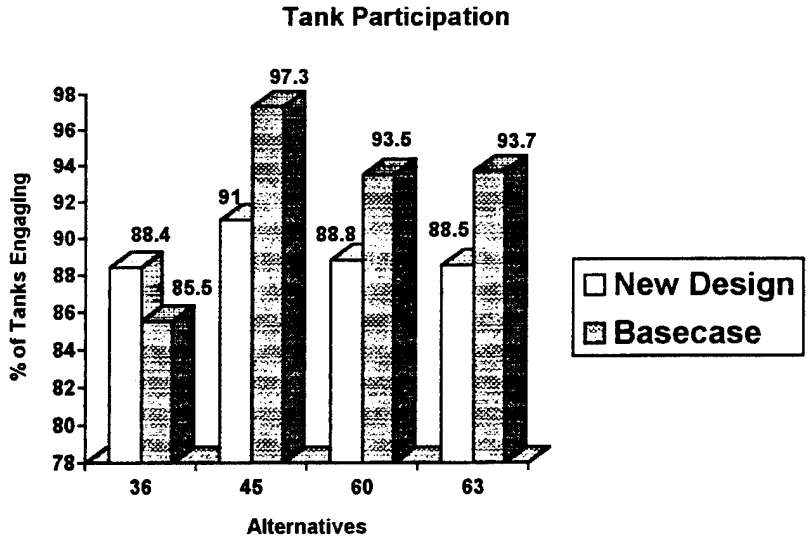
Fort Knox initially considered eighteen possible M1A2 tank battalion alternatives. The range of alternatives included a low-end variation of 26 tanks per battalion and a high-end variation of 90 tanks per battalion. The variable factors in each permutation were: 3, 4 or 5 tanks per platoon; 2, 3 or 4 platoons per company; and 3 or 4 companies per battalion. The eighteen alternatives are listed below.[74]

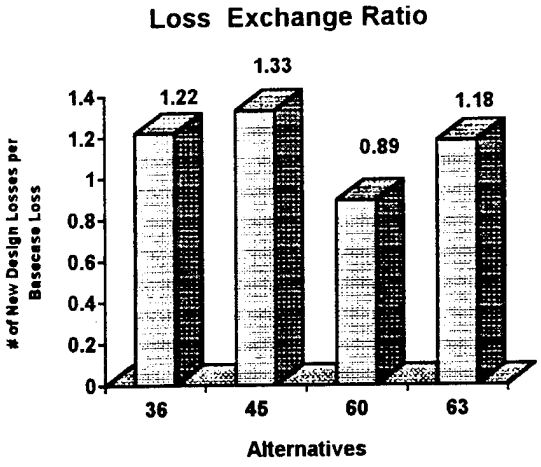
Armor School M1A2 Tank Battalion Alternatives

Tk/Plt	Plt/Com	Co/Bn	Tot. Tk's
3	2	3	26
3	2	4	34
3	3	3	36
3	3	4	46
3	4	3	44
3	4	4	63
4	2	3	32
4	2	4	42
4	3	3	45
4	3	4	58
4	4	3	60
4	4	4	74
5	2	3	38
5	2	4	50
5	3	3	53
5	3	4	70
5	4	3	68
5	4	4	90

The Armor Center narrowed the possible alternatives by eliminating the five-tank platoon and the two-platoon company from consideration. The brief contained no explanation behind the decision to eliminate these two permutations. From the remaining alternatives, the Armor Center recommended the 36, 45, 60 and 63-tank battalions to CAC for further analysis. Decisionmakers considered these four alternatives distinct enough to provide insights on the strengths and weaknesses of various organizations during analysis.[75]

Fort Knox conducted a cursory computer analysis and a key leader survey to distinguish the four alternatives. The computer analysis consisted of a simple force-on-force simulation between the current 58-tank organization and each of the four alternatives. Analysts filtered out of the simulation doctrinal attachments normally associated with armor organizations in combat (artillery, infantry, air defense and others) to focus solely on armor versus armor data.[76]





The tank participation data revealed the 36 tank alternative as lacking the robustness necessary to induce engagement from fifteen percent of the basecase force. Analytically, this means the basecase force could reserve a significant portion of its firepower and still mass fires on the 36 tank alternative. Conversely, the other three alternatives each induced in excess of 93% of the basecase force into engagement. Additionally, loss exchange data depicted higher new design per basecase losses in the 36, 45 and 63-tank alternatives.[77] The inability to mass fires was the reason behind the first two cases while presentation of a target-rich environment was the reason for the last case. Only the 60-tank alternative lost less than the basecase.

The Armor Center conducted a survey in conjunction with the computer analysis. The survey queried current and prior armor battalion commanders and operations officers at Fort Knox on a wide range of tank battalion attributes. Each officers completed a "Tank Battalion Characteristics Preference Matrix" that consisted of fifteen attributes: lethality, agility, mobility, survivability, robustness, deployability, flexibility, versatility, modularity, tailorability, sustainability, self-contained, single-purpose, high leader-to-led ratio and low leader-to-led ratio. The participants ranked each characteristic in comparison to the other fourteen. The five characteristics that percolated to the top were agility, lethality, survivability, mobility and sustainability.[78]

Next, the Armor Center incorporated the top five characteristics identified by armor battalion commanders/operations officers into a decision matrix to compare the four alternatives. The alternatives were rank ordered with respect to each characteristic based on a combination of computer analysis and subjective assessment. The results were as follows:[79]

	Alternatives			
Criteria	36	45	60	63
Agility	3	4	1	2
Lethality	4	3	2	1
Survivability	4	3	2	1
Mobility	3	4	1	2
Sustainability	1	2	3	4
Total *	15	16	9	10

* Less is Better

As a result of the above critique, the Armor Center recognized the 60-tank alternative (4-tank platoons, 4-platoon companies and 3-company battalions) as the most favorable alternative based on the cursory analysis.[80] However, the school presented all four alternatives to CAC as potential M1A2 tank battalions. CAC will, in turn, incorporate the various alternatives from other TRADOC institutions (Infantry Center, Field Artillery Center and others) into combined arms organizations for detailed analysis. Though each institution may recommend specific alternatives, CAC will act as the "honest broker" to filter parochialism and ensure compatibility between branches.

Military Innovation in Peacetime

> *"...there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, then to initiate a new order of things. For the reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order...(because) of the incredulity of mankind, who do not truly believe in anything new until they have actual experience of it."*[81]
>
> Niccolo Machiavelli

True innovative thought is a formidable task. It is even more so if a crisis does not exist that conditions the status quo to accept innovative ideas. Innovation within the military is no different.

Military decisionmakers are comfortable with historically proven, combat-tested concepts. This reliance upon historical evidence will suffice as long as there is little change in doctrine or technology. However, a fundamental shift in doctrine or technology must rely upon innovation to harness the inherent potential. Force XXI is, perhaps, a fundamental shift in land warfare technology. Applying decades-old organizational design that has been combat-proven in an archaic form of warfare to new technology will not produce the desired results. The army must evaluate innovative organizations now - early in the Force XXI process. A review of both armor innovation in post World War I Germany and academic responses to military innovation in peacetime provide insights applicable to armor organizational challenges today.

There has arguably been only a single burst of innovative energy within the armor community since its World War I conception. After World War I, several powers contemplated the proper application of armor on the future battlefield. Germany - with respect to France, Great Britain, Russia and the United States - provided the answer to this question: blitzkrieg tactics. While other armies found it difficult to break with past experience, the German army incorporated innovative ideas into a revolutionary warfighting doctrine. What conditions existed that enable innovative ideas to receive attention within the German army after World War I?

First, the Treaty of Versailles purged the German Army of the "dead-weight of unprofessional masses and of aging, cumbersome equipment."[82] The treaty limited the army to an endstrength of 100,000 soldiers. Germany ensured the few citizens permitted in uniform were the proverbial best and brightest. The Reichsheer (National Army) recruited only those that met the highest physical and educational requirements. Additionally, the Reichsheer concentrated its efforts on cooperation within the army.

> "...it encouraged the closest possible cooperation between all branches in the Army, fostered by a spirit of teamwork and the development of an effective system of communications between all levels, and types, of command."[83]

Second, the German Army viewed technology simply as a means to realize their traditional form of warfare. Technology (the tank and airplane) was not an end in itself. The great Prussian von Moltke established the German military practice of exploiting the material resources and technological innovations of the age. It was his readiness to use the new, and to explore the unknown, that made Germany a world power in the mid nineteenth century.[84] After World War I, Germany did not revise its ideas on warfare. It simply applied the emerging technology (tank and airplane) in an innovative way (blitzkrieg) toward a traditional end (rapid, decisive maneuver).

Finally, a persistent visionary emerged that forced theory into practice. Germany, like the Allies, struggled with the tank's utility. The same two schools prevalent in the U.S. Army emerged in the Germany Army: tanks in support of infantry or tanks as an independent arm. Heinz Guderian was the champion of the latter school. Actung! Panzer!, a collection of his best articles and lectures endorsing tanks and the armored division, was republished in 1937. The book spurred professional debate within the German Army hierarchy. The German Army adopted blitzkrieg tactics and armored divisions primarily through his persistent endorsement.[85] Other armies of the day did not have such a visionary with the persistence and position to field armored divisions with a complementary doctrine.

In summary, conditions were ripe for the implementation of innovative ideas in post World War I Germany. Interservice and interbranch rivalry, though existent, did not dominate decisionmaking. The army saw technology as a means to an end. Finally, a unique visionary emerged that forced theory into practice. The U.S. Army can draw valuable lessons from the German Army's interwar experience. Interbranch rivalry, a real possibility in light of the declining resources, must be kept in check. Additionally, the current infatuation with technology cannot overshadow the task at hand: to integrate technology into organizations, not organizations into technology. Finally, the army leadership must continually monitor Force XXI progress.

Complicating matters is the fact that reliance upon past organizational practices may not be feasible. The army's dilemma, then, is to promote innovation during peacetime after winning the Cold War. Two authors outline the challenges of peacetime military innovation and suggest courses of action.

Stephen Rosen specifically addresses the subject of peacetime military innovation in his 1991 book, Winning the Next War. Rosen discounts the "conventional wisdom that catastrophic military defeat provides the catalyst that leads to change after the war ends."[86] Instead, he cites: "History is in fact full of examples of armies and navies that were defeated and went on being defeated because they did not innovate."[87] Rosen advocates the necessity of civilian intervention to force the military to innovate. The military, if left to their own devices, are too bureaucratic to change themselves. However, this does not mean that the military has no say in the innovation direction. Rosen prescribes the following:

> "...peacetime military innovation occurs when respected senior military officers formulate a strategy for innovation, which has both intellectual and organizational components. Civilian intervention is effective to the extent that it can support or protect these officers."[88]

U.S. military historical cases reviewed by Rosen suggest that military planners were driven to consider the need for innovation by changes in the security environment in which their organizations would have to fight in the foreseeable future. Simulations enable planners to visualize future warfare and potential capabilities. Finally, Rosen states that the behavior of the organization must change if innovation is to take hold. "The intellectual innovation had to be accompanied by a political process that changed the way the officers and men of the military lived their professional lives."[89]

Harold R. Winton also addresses military innovation in his 1988 book, To Change An Army. Winton seeks an answer to the following question: Why did the British Army, whose members first presented the concepts of blitzkrieg, fail to adopt them during the interwar period? Though

the book focuses on the career of General Sir John Burnett-Stuart, several points on peacetime military innovation shine through in Winton's conclusion. First and foremost, there is a "continuous requirement for senior military leaders to articulate a vision of the nature of future war."[90] Second, Winton highlights the importance of doctrinal development. His specific concerns with doctrine are "how it is to be implemented in terms of organization, weapons and equipment, and methods of training."[91] Third, he emphasizes the importance of consensus building to "overcome ingrained habits and branch parochialism."[92] Finally, reformers must balance original thought with traditional temperament to prevent from being isolated from the mainstream.[93]

Rosen and Winton's complementary analyses apply to today's Force XXI armor organizational initiative. There has been a change in the security environment. A vision of the future from senior leadership presently exists. The army must now embrace the vision, overcome institutional biases, and give consideration to truly innovative ideas in armor organization.

Analysis

> *"...failure to change sufficiently is rooted in the political, institutional, historical, and strategic relationships that...mold and adapt new weaponry to prevailing doctrine. The army viewed technological developments from the perspective of already accepted concepts and did not perceive new ideas or weapons overturning or forcing a fundamental transformation or revision."*[94]
>
> Robert Doughty in Seeds of Disaster

The following analysis will concentrate on two areas. The first section is a general assessment on the potential for deriving the optimal Force XXI tank battalion organization given the Armor Center alternatives. The second section will focus on the Armor Center's alternatives in relation to the relevant factors discussed earlier: lethality, span of control and the anticipated role of armor in the future.

Assessment on Potential for Deriving Optimal Force XXI Tank Battalion Organization

The Armor Center alternatives provided to CAC, Fort Leavenworth for integration into combined arms analyses are permutations of historically proven armor organizations at battalion level and below. This is an integral flaw of the Force XXI process. Recommendations emanating from institutions that hold vested interests in the eventual outcome are naturally conservative. As stated earlier, there is solace found in the historically proven status quo.

The four alternatives put forward by the Armor Center offer little in the way of innovation. The substantial range between alternatives (36 to 63 tanks per battalion) obscures the fact that there are no innovative organizations forwarded for analysis. The options are: three or four tanks per platoon; three or four platoons per company; and three or four companies per battalion. The pros and cons of the historically proven organizational designs are well documented in past analytical efforts. Remarkably, it is practically the same debate waged by World War II veterans exactly fifty years ago.

The Armor Center alternatives suggest that Force XXI technology will have little impact on future armor battalion organization. Perhaps the army will discover - after extensive simulation and field testing - the historically proven armor organizations remain appropriate for the M1A2 Force XXI battalion. But this conclusion is premature. Today - during the early phase of analysis - it is critically important to consider the possibility that Force XXI technology may fundamentally alter present organizational guidelines. In other words, the army must analyze innovative organizational designs to gain an appreciation of Force XXI technology capabilities and limitations. Simply forwarding historically proven organizational designs undermines the intention of the Force XXI process.

Comparison of Recommendations with Identified Factors Bearing on the Problem

Lethality. Lethality was a definite concern of the Armor Center. The decision matrix rated larger organizations as more lethal than smaller ones. When comparing organizations with like technologies, larger is logically more lethal. The lethality issue must center on marginal utility. How much more lethal is the 45-tank alternative than the 36-tank alternative? The marginal utility may be slight given the internal organization of each alternative (tanks/platoons/companies). Force XXI technology may produce highly lethal organizations that are unconventionally small. In turn, diminishing returns will set in at the lower end of the alternative spectrum. The key to warfare - both today and in the future - is to mass *effects* vice systems over space and time. Force XXI organizations may be able to do this with smaller units. Additionally, the army must alter its lethality criteria. Simply equating lethality with ability of one organization to acquire and engage another disregards the anticipated informational capability that underscores Force XXI. Logically, an organization that possesses vital battlefield information will be more lethal than one that does not. Lethality criteria must reflect this supposition.

Span of Control. The Fort Knox alternatives suggests Force XXI technology will not alter the current span of control capability within organizations. While initial alternatives generated at the Armor Center included 5-tank platoons and 2-platoon companies, the alternatives forwarded to CAC left open for debate only the traditional small unit organizations described above. Force XXI technology may alter current span of control practices. The Armor Center should give serious consideration to unorthodox organizations during this conceptualization stage of development. As stated above, presenting only historically proven organizations for analysis quashes innovative ideas

Role of Armor in the Future. Finally, the decision matrix derived from the survey results incorporated criteria that contradicts Force XXI guidance. Force XXI guidance is clear. Future

organizations must be tailorable, expansible, deployable, and employable in a joint/combined environment.[95] None of these characteristics were included in the decision matrix. Instead, the survey determined agility, lethality, survivability, mobility and sustainability to be the foremost criteria for ranking tank battalion alternatives. These characteristics are certainly critical to the conduct of Air-Land Battle. However, their applicability to Force XXI operations is debatable. This may be a function of the survey population. A more diverse population may have considered Force XXI ramifications. The net result was criteria that favored larger (hence more lethal and survivable) organizations. Larger may be the right answer, but it must be for the right reasons.

Conclusions and Recommendations

> *"The order to innovate is likely to be ambiguous because what is being ordered is not some familiar, well-defined task, but something that has never been done before. Those being ordered to innovate may well not have control over everything needed to carry out the order, particularly if what is needed is unconventional creativity."*[96]
>
> Stephen Peter Rosen

It is human nature to clasp onto the familiar present in lieu of the uncertain future - regardless of the potential apparent in the future. Yet, only by letting go of the decades-old rationale behind armor organization can the armor community realize the full potential of Force XXI. Innovative ideas must emanate from within the armor community on how best to organize to take advantage of this technology. Listed below are several recommendations for consideration by the Armor Center/CAC and areas requiring additional research.

Recommendation 1: *Focus on the platoon*. The Armor Center methodology examined permutations of platoons, companies and battalions within the same analysis. The platoon must be the base upon which the rest of the battalion is built. During the Division Restructuring Study in the late 1970s, the army focused primarily on determination of the best tank platoon organization.[97] Once force designers agreed that the four tank platoon was the best solution, organizing the

remainder of the battalion was a relatively clear-cut process. Moving forward with various battalion alternatives with different platoon organizations is counterproductive.

Recommendation 2: *Look at platoon options at the extremes*. IVIS and other related technologies can potentially widen span of control at the lowest levels. Conversely, increased lethality supports smaller organizations. Thus, force designers should examine platoon organizations at the extremes. First, they should explore large platoons - perhaps seven or eight tanks. If deemed feasible, perhaps two platoons would constitute a company. In short, the army should push down combat power to the lowest echelon capable of commanding and controlling it. New technologies could make the platoon of the future more lethal than the company today.

Second, force designers should examine a platoon of two tanks. Future technology and doctrine may relegate tanks to armored sensor platforms that will direct precision guided munitions onto target. The Mobile Strike Force, a Force XXI experiment incorporated into the annual Prairie Warrior exercise at Fort Leavenworth, aims to defeat the enemy with long-range precision munitions. Heavy forces merely support this effort by protecting the long range shooters. If this is the wave of future combat, small platoons dispersed about the battlefield may be the answer.

In short, the present platoon alternatives forwarded to CAC by the Armor Center leave little room for investigating new methods of conducting land warfare. Unconventionally large and small platoons hold unique advantages when considered in the context of future technologies and their potential employment. This is not to say that the three or four tank platoon is not the answer for the Force XXI tank battalion. Simulation and field testing may reveal the historically proven solution will continue to apply in the future. However, the methodology adopted to date precludes investigation of alternatives at the extremes.

Recommendation 3: *Make three companies the high-end alternative*. The cross-attachment requirement with mechanized infantry battalions drove the decision to organize current battalions

with four companies. This enabled brigade commander's to organize battalions as armor heavy, mechanized heavy or balanced for a given mission. Additionally, it gave battalion commanders a base-of-fire company while retaining three companies for fire and maneuver.[98] The fourth company is a luxury the army can no longer afford. Simply stated, armor organizations must get smaller to increase deployability. The best way to do this is reduce the number of companies per battalion. The increased lethality and new informational technology will more than make up for the loss of a company. Could two companies constitute a battalion? Perhaps - dependent upon the size of platoons and companies. Again, the army must not rule out unconventional organizations due to historical experience.

There are several areas identified in this monograph that require additional research. First, tailorability of armor organizations will be critical in future contingencies. What are the requirements for tailorability at the platoon and company level? What assets must be inherent to such organizations in support of light or USMC forces? Second, what are the compatibility issues between small armor organizations (platoon and company) and light forces and the USMC? Will the informational technology that provides an incredible advantage to the M1A2 organization be integrated across service lines? If not, how should commanders modify organization? Finally, are pure tank battalions becoming an obsolete organization? Should the army consider a combined arms battalion (armor, mech, light mix) that is tailorable for specific missions?

This monograph does not propose a specific M1A2 tank battalion organization. A specific recommendation would draw scrutiny away from the paper's intent: to get innovative ideas on armor battalion organization onto the table. However, the recommendations above do favor armor battalion organizations that are significantly smaller than today's.

Summary

"The tank today is as anachronistic as medieval body armor ... It has become the Juggernaut of modern military technology, demanding high capital outlay and enormous logistical support and not much more effective than that of the lone enemy guerrilla who destroys the tank with a well-placed rocket."[99]

LTC Warren W. Lennon

LTC Lennon speaks for many in the military today. A portion of the army will always question the utility of the tank - perhaps for good reason. However, LTC Lennon's quote is from a 1972 article in Armor. Since then, the army has fielded several versions of the M-60 tank, the M-1, M1A1 and, most recently, the M1A2 tank. The tank is here to stay for the foreseeable future. It may no longer be the dominant weapon system on the battlefield, but it will continue to be an integral part of Force XXI well into the next century.

Armor battalion organization has changed little since World War II for good reason. Though technology increased the survivability and lethality of the tank over time, informational technology stagnated. Force XXI technology will soon bring informational capability on par with lethality and survivability technology. The army must divorce itself from historical rationale and embrace innovative - perhaps unconventional - organizations. The Armor Center alternatives provide CAC with a range of options - from 36 to 63 tanks per battalion. Yet, it is simply new numbers with old math. The army must examine the viability of novel organizations to determine the best utilization of Force XXI technology.

Michael Howard and Stephen Rosen have described the challenges of change during peacetime. Now is the time to welcome unconventional thought. Repressing ideas today will lead to a smaller Cold War army with "new toys." The army must address Rosen today to realize Howard in the future; it must promote innovation now so as not get it "too badly wrong" in the next war.

Endnotes

[1] Martin Blumenson. The Patton Papers. (Boston: Houghlin Mifflin Company. 1972). 427.

[2] Ibid.. 508-509.

[3] Michael Howard. "Military Science in the Age of Peace." (Journal of the Royal United Services Institute for Defense Studies. March. 1974). 8.

[4] Harold R. Winton. To Change an Army. General Sir John Burnett-Stuart and British Armoured Doctrine. 1927-1938. (Lawrence: University Press of Kansas. 1988). 240.

[5] Blumenson. 434. Patton. in a letter to his wife on 9 November 1917. states "The best I could get in the line would be a Battalion of infantry. There will be hundreds of such battalions and my chances of exceptional distinction would be divided by just the number of Battalions."

[6] Ibid.. 432. The exact date is unclear. There is some evidence that the official order may have been transmitted on 6 Nov 1917 based on Patton's letter to his father on that date.

[7] Timothy K. Nenninger. The Development of American Armor. 1917-1940. (Thesis. University of Wisconsin. 1968). 29.

[8] Blumenson. 442-447.

[9] Ibid.. 450-451. Patton's report addressed every detail pertaining to the proposed tank battalion. Additionally. his maintenance philosophy was remarkably similar to the Division 86 concept instituted seventy years later. "A battalion would then consist of 18 officers. 331 men. 77 tanks and 42 other vehicles. Patton suggested placing all the supply trucks at the battalion headquarters in order to provide flexibility. He thought it would be better to assemble the twelve mechanics of the three companies from time to time at the battalion level to facilitate large repair jobs.

[10] Nenninger. 20. Though Pershing approved these organizations. the "stress and strain of war prevented its completion."

[11] LTC Ken Steadman. "The Evolution of the Tank in the U.S. Army. 1919-1940. (Combat Studies Institute. U.S. Army Command and General Staff College. 21 April 1982). 3-9.

[12] Nenninger. 187. There was a conscious decision - approved by General Marshall - to designate a new. separate "armored" force. This new name symbolized the break from the old way of thinking (tanks in support of infantry). Adna Chaffee's comments captures the urgency of the moment. "Speed is essential ... We must not stop and haggle over a lot of detail and figure out a lot of things that have been studied over by boards and commanding officers in the field and tested in maneuvers time and again."

[13] MAJ Arthur W. Meyers. CPT Jack Schram. CPT John Cassidy. CPT Guy Troy and CPT Bernard Ploshay. The Feasibility of One Standard Tank Company and One Standard Tank Battalion. (Fort Knox. Kentucky. April. 1953). 5.

[14] Ibid.. 10.

[15] Richard M. Orgorkiewicz, Armor: A History of Mechanized Forces, (New York: Frederick A. Praeger, Inc), 89. The 1941 maneuvers identified a lack of balance between armor and infantry within the armored division structure. There were 25 tank companies and only 7 rifle companies. "In consequence, the organization of the division was remodeled to give them better balance..."

[16] Meyers, 11.

[17] Ibid., 18.

[18] Ibid., 16.

[19] Ibid., 38.

[20] Ibid., 1-3.

[21] Ibid., 94-149. The Armor School officers surveyed or interviewed 22 World War II commanders - from First Lieutenant to Major General.

[22] John L. Romjue, The Army of Excellence: The Development of the 1980s Army, (United States Army Training and Doctrine Command, Fort Monroe, Virginia, 1993), 5.

[23] Orr Kelly, King of the Killing Zone, (New York: Berkley Books, 1989), 216.

[24] Ibid., 224-227.

[25] Ibid., 230-238.

[26] Second Brigade, First Cavalry Division, Final Report: Division Restructuring Study, Volume I, (Fort Hood, ,Texas, 16 August 1979), 1-1.

[27] Combined Arms Center, Division Restructuring Evaluation: Executive Summary, (Fort Leavenworth, Kansas, 1 September 1978), 1-2.

[28] U.S. Army Training and Doctrine Command, Division Restructuring Study: Phase I Report, (Fort Monroe, Virginia, 1 March 1977), 31.

[29] Ibid., 36.

[30] Headquarters, TRADOC Combined Arms Test Activity, "Three Tank Platoon Versus Five Tank Platoon", (Fort Hood, Texas, 17 November 1976), 33.

[31] Second Brigade, First Cavalry Division, Final Report: Division Restructuring Study, Volume II, (Fort Hood, Texas, 16 August 1979), 2-12.

[32] Ibid., 2-15 - 2-16.

[33] Combined Arms Center, Division 86: Final Report, (Fort Leavenworth, Kansas, October 1981), 2-2.

[34] Nenninger, 107.

[35] Kathleen A. Quinkert, "Crew Performance Associated with the Simulation of the Commander's Independent Thermal Viewer," (United States Army Research Institute for the Behavioral and Social Sciences, Alexandria, Virginia, July 1990), 2-6.

[36] Captain Derek C. Schneider, "Combat Vehicle Command and Control," (Armor, July-August 1994), 41.

[37] Ibid.

[38] Telephone interview with Major Armor Brown, Combat Arms Division, DA ODCSOPS, 26 August 1995.

[39] Sir Ian Hamilton, The Soul and Body of an Army, (New York: George H. Doran Co., 1921), 229.

[40] Stephen M. Walt, "The Case for Finite Containment," Conventional Forces and American Defense Policy, ed by Steven E. Miller and Sean M. Lynn-Jones, (Cambridge: The MIT Press, 1989), 1-2, 7-8, 32-38.

[41] Lorna S. Jaffe, The Development of the Base Force 1989-1992, (Washington, DC: U.S. Government Printing Office, July 1993), 48. This document gives the rationale behind the eventual inclusion of this concept into the NMS. General Powell believed the best way to deter aggression regionally was to apply overwhelming force.

[42] Sean D. Naylor, "Digitized Force: Better, But Not Smaller", The Army Times, 23 October 1995., 32.

[43] The New American Bible, (Encino: Glencoe Publishing Co., 1970), Exodus 18: 21-22, 93.

[44] Carl von Clausewitz, On War (Princeton: Princeton University Press, 1976), 294.

[45] Ibid.

[46] Ibid.

[47] Ibid.

[48] Harold Koontz, Cyril O'Donnell and Heinz Weihrich, Management, (New York: McGraw Hill Book Company, 1980), 341-343.

[49] Alan C. Filley and Robert J. House, Managerial Process and Organizational Behavior, (Glenview: Scott, Foresman and Company, 1969), 292-293.

[50] Ibid, 289.

[51] Koontz, 353-354. The authors give much weight to the concept of "balance." "What is required, of course, is a more precise balancing, in a given situation, of all pertinent factors."

[52] Interview by Major Andrew S. Sandoy, SAMS student, with Mr Robert Keller, Director, Force Design Directorate, U.S. Army Combined Arms Combat Development Activity, Fort Leavenworth, Kansas. August 1990.

[53] Koontz, 340-341.

[54] Walt, 1-2, 7-8, 32-38.

[55] Jaffe, 3, 8. President Bush issued National Security Review 12 on 3 March 1989. This started the strategy review in motion.

[56] Jaffe, 14-15, 17, 44.

[57] Briefing slides, Department of the Army, ODCSOPS, War Plans Division

[58] Ibid.

[59] Ibid.

[60] TRADOC Pamphlet 525-5: Force XXI Operations (Fort Monroe, Virginia, 1 August 1994), i.

[61] Ibid., 2-8 - 2-10.

[62] Ibid., 2-10.

[63] Ibid., 3-1.

[64] Ibid., 3-6

[65] Chris Bellamy, The Future of Land Warfare, (New York: St. Martin's Press, 1987), 274-300.

[66] Bevin Alexander, The Future of Warfare, (New York: W.W. Norton & Company, 1995), 217-220.

[67] FY93 DoD Authorization Act, Public Law 102-484, Section 903. The Congress requested the U.S. Army and USMC review this issue within the context of the then pending Roles and Missions review. Specifically, the Congress "encourages the Chairman of the Joint Chiefs of Staff to examine whether (a) the Army should provide the Marine Corps with armor and heavy fire support needed for mid-intensity and high-intensity combat; or (b) the Marine Corps should be equipped with the armor and heavy fire support needed to engage in mid-intensity and high-intensity combat independent of the other military services." Additionally, Congress gave discreet guidance to the CJCS on the specific issues for review. "In conducting the examination, the Chairman should consider the following actions: ...designating Army tank battalions to support Marine amphibious forces afloat."

[68] Force XXI: America's Army of the 21st Century, (Director, Louisiana Maneuvers Task Force, Fort Monroe, Virginia, 15 January 1995), 1.

[69] George T. Singley III, "Today's Investments Shape Tomorrow's Force," (Army, May 1995), 48.

[70] Combined Arms Center Brief, "The Division Alternatives", 12 July 1995.

[71] Force XXI: America's Army of the 21st Century, 25.

[72] The Armor Center brief on proposed tank battalion organizations for Force XXI, 12 July 1995.

[73] Ibid.

[74] Ibid.

[75] Ibid.

[76] Ibid.

[77] Ibid.

[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] Niccolo Machiavelli, The Prince, (New York: New American Library, 1952), 49-50.

[82] Matthew Cooper, The German Army, 1933-1945, (Chelsea, MI: Scarborough House Publishers, 1978), 118.

[83] Ibid.

[84] Ibid., 132.

[85] Ibid., 143-154. Cooper states that Guderian's efforts were in vane since the German Army eventually adopted an infantry based organization. However, Guderian's ideas received enough recognition to warrant the establishment of several armored divisions and the adoption of blitzkrieg tactics. Other armies of the day, faced the same dilemma, did not combine the right organization with the right doctrine. For this, Guderian must receive credit.

[86] Stephen Peter Rosen, Winning the Next War, (Ithaca: Cornell University Press, 1991), 8.

[87] Ibid., 9.

[88] Ibid., 21.

[89] Ibid., 75.

[90] Winton, 239.

[91] Ibid.

[92] Ibid.

[93] Ibid.

[94] Robert Allan Doughty, The Seeds of Disaster (Hamden, Connecticut: Archon Book, 1985), 182.

[95] TRADOC Pamphlet 525-5, 3-2 - 3-3.

[96] Stephen Peter Rosen, Winning the Next War, (Ithaca: Cornell University Press, 1991), 10-11.

[97] U.S. Army Training and Doctrine Command. Division Restructuring Study: Phase I Report. (Fort Monroe, Virginia, 1 March 1977), 4, 14. Early in the DRS, TRADOC made a conscious effort to focus on the platoon effort separate from higher echelons.

[98] Combined Arms Center, Division 86: Final Report, (Fort Leavenworth, Kansas, October 1981), 2-2.

[99] Lieutenant Colonel Warren W. Lennon, "The Death of the Tank, (Armor, January-February, 1972), 14.

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